

What is claimed is:

1. A glutamic acid receptor protein having the following properties:

(A) it has a transmembrane domain and an intracellular domain common to those of type 4 metabotropic glutamic acid receptor protein, and

(B) it has an extracellular domain by about 316 or 327 amino acid residues shorter than that of the type 4 metabotropic glutamic acid receptor protein.

2. The glutamic acid receptor protein according to claim 1, wherein the protein is expressed in rat small intestine and large intestine.

3. The glutamic acid receptor protein according to claim 1, wherein the protein comprises the amino acid sequence shown in SEQ ID NO: 7 or the amino acid sequence consisting of amino acids numbers 12 to 584 in the amino acid sequence shown in SEQ ID NO: 7.

4. A DNA which encodes a glutamic acid receptor protein according to any one of claims 1 to 3 and does not express type 4 metabotropic glutamic acid receptor protein.

5. A cell harboring a DNA which encodes the glutamic acid receptor protein according to any one of claims 1 to 3 in an expressible form.

6. A method of producing glutamic acid receptor protein or a cell harboring the glutamic acid receptor protein, comprising cultivating a cell harboring a DNA which encodes the glutamic acid receptor protein according to any one of claims 1 to 3 in an expressible form in a medium to produce the glutamic acid receptor protein.

7. A method of screening an agonist, an antagonist, or an allosteric modulator of glutamic acid, comprising the steps of reacting the glutamic acid receptor protein according to any one of claims 1 to 3 with a substance that binds to the protein in the presence of a test substance, and detecting inhibition or promotion of the reaction.

8. A method of screening an agonist of glutamic acid comprising the steps of reacting a glutamic acid receptor protein according to any one of claims 1 to 3 and a test substance, and detecting the reaction.

9. A method according to claim 7, wherein the cell according to claim 6 or a membrane fraction prepared from the cell is used as the glutamic acid receptor protein.

10. A method according to claim 9, wherein the inhibition or promotion of the binding is detected by a second messenger generated by the glutamic acid receptor protein.

11. A method according to claim 8, wherein the cell according to claim 5 or a membrane fraction prepared from the cell is used as the glutamic acid receptor protein.

12. A method according to claim 11, wherein inhibition or promotion of the binding is detected by a second messenger generated by the glutamic acid receptor protein.

13. An antibody that specifically binds to the glutamic acid receptor protein according to any one of claims 1 to 3.

14. A method of producing a drug for modulating a second messenger generated by binding glutamic acid to a

glutamic acid receptor, comprising the steps of:

reacting the glutamic acid receptor protein according to any one of claims 1 to 3 with a substance that binds to the protein in the presence of a test substance and detecting inhibition or promotion of the reaction to screen an agonist, an antagonist, or an allosteric modulator of glutamic acid; and

preparing a pharmaceutical composition containing the agonist, antagonist, or allosteric modulator of glutamic acid obtained in the reacting step as an active ingredient.

15. A method of producing a drug for modulating a second messenger generated by binding glutamic acid to a glutamic acid receptor, comprising the steps of:

reacting the glutamic acid receptor protein according to any one of claims 1 to 3 with a test substance and detecting the reaction to screen an agonist of glutamic acid; and

preparing a pharmaceutical composition containing the agonist of glutamic acid obtained in the reacting step as an active ingredient.